

There is also a detailed tabular comparison of the plants of Suffolk with those of Norfolk, Cambridgeshire, and Essex, and a short chapter on the characteristic plants of the different soils of the county, which will be found very interesting to students of plant-dispersion. The chapters contributed by Dr. Wheeler Hind, the son of the editor, on the geology, physical geography, and meteorology of the county are very full, clear, and add greatly to the interest of the book.

One of the most interesting circumstances in the county flora is the occurrence of several maritime plants far inland. In the Breck country, between Thetford and Mildenhall, grow *Vicia lutea*, *Erythraea littoralis*, *Rumex maritimus*, *Carex arenaria*, *Phleum arenarium*, and *Corynephorus canescens*. These are all seaside plants, and their occurrence fifty miles inland is accounted for by Prof. Newton and the editor by supposing that an arm of the sea has penetrated here southward from the Wash at a comparatively recent period.

It is in Norfolk and Suffolk that the most valuable observations have been made, by Mr. Clement Reid and his fellow-workers, in illustration of the time of origin of our present British flora. The Cromer plant-bed extends into Suffolk, past Pakefield, to Southwold and Dunwich. This is pre-glacial, and yet, out of upwards of forty plants found in it that have been clearly identified, there are only two that are not British now—the spruce fir and *Trapa natans*. At Hoxne, near Diss, lacustrine deposits have been found resting on a bed of boulder clay, but beneath beds which contain bones of the elephant. In these are contained *Salix polaris*, *S. Myrsinites*, *Betula nana*, *Hypnum sarmentosum*, and a *Pinus* which is probably *sylvestris*—all characteristic Arctic-Alpine types, associated with many lowland plants which grow unchanged in Suffolk at the present time. A chapter in the book contains a list of all these plants, but their geological position is not clearly explained.

It will be seen that this is a very interesting and complete county flora, and that it is worthy of being studied carefully by all who are interested in the distribution of our indigenous plants.

J. G. B.

THE MANUFACTURE OF IRON AND STEEL.

Iron and Steel Manufacture. By Arthur H. Hiorns. (London: Macmillan and Co., 1889.)

THIS volume is meant as a text-book for beginners, and will very worthily occupy that position. It is full of information, and information of the very kind which the student should possess before entering upon the study of the greater works of Percy or Phillips. On the other hand, those already engaged in the metallurgy of iron and steel will find in these pages much that may be referred to.

The book begins with a brief history of the processes that have been employed down to our own time, the landmarks in which are Dud Dudley's successful attempts to smelt with coal at the beginning of the seventeenth century; Cort's introduction of the puddling process in 1784; Neilson's recommendation to use hot blast in 1828; the revolution produced in the iron trade by the invention of the Bessemer steel process in 1855, as supplemented by R. F. Mushet, of the Siemens furnace and steel

process, and finally of Thomas and Gilchrist's basic process.

The chapter which deals with chemical principles and changes, inserted for the benefit of those having a limited knowledge of chemistry, is valuable on account of the simple manner in which it is written; this is particularly the case as regards oxidizing and reducing agents, the examples given of oxidation and reduction showing the reactions very clearly. A chapter is devoted to the definition of metallurgical terms, refractory materials and fuel, another to the ores and alloys of iron, and then a description of the various processes employed in the metallurgy of iron and steel is given, attention being pretty equally divided between the two metals.

The most ancient and most difficult method of extracting iron from the ore is what is known as the direct method, and the author explains clearly the two causes of its failure, whether in the case of the old Catalan or any of the modern processes, and the reason why the blast furnace, although an indirect, has proved so successful a method. These two causes are "the easy oxidation of iron by carbonic acid and water, at the temperature at which ferrous oxide is reduced to the metallic state by carbon, carbonic oxide, or hydrogen, and the facility with which iron at a red heat combines with carbon."

The preparation of the ores for reduction in the blast furnace and their treatment therein are next brought forward, the advantages and disadvantages of the hot blast, the utilization of waste gases, the dimensions and form of blast furnace and subsidiary subjects being treated of.

The metal being now in the state of pig-iron, the means of refining and puddling are described; the various arrangements are set forth by which attempts have been made to effect the work of the puddler by mechanical means, whether by automatic rabblers or rotatory furnaces, and their relative advantages and disadvantages. A chapter is devoted to the treatment of puddled iron under the hammer and in the rolling mill, and to the tinning and galvanizing of iron.

Leaving the subject of malleable iron, the author next considers the question of iron-founding. He describes the cupola furnace in which the pig metal is fused; and the various methods of moulding and casting, and the brands of pig-iron used for different purposes, are treated of.

About a third of the book is devoted to the consideration of steel; it is in this branch of the treatment of iron that the greatest development has occurred of late years, and the book under review treats of all the modern practice. It is pleasant to find, too, in the preparation of an elementary work, that constructive perspective has been employed. Modern processes are not brought into prominence simply because they are modern, and ancient methods are not thrown into the shade if still employed. Amongst the latter we find full attention given to the cementation process, and crucible steel; whilst a chapter is devoted to each of the processes of Bessemer and Siemens. The book finishes with a chapter on steel-casting and on testing.

The volume before us is intended to assist pupils preparing for the ordinary grade examinations of the City and Guilds of London Institute, and its author—the principal of the School of Metallurgy in connection with

the Birmingham and Midland Institute—is to be congratulated on the good work he has done in this connection. The book is illustrated with 72 figures, which agree with the simplicity and clearness of the diction, and questions are found at the end of each chapter, which have been well prepared to test the learner's apprehension of its contents. We are pleased to be able to recommend this little work, as a foundation for the study of the metallurgy of iron and steel.

OUR BOOK SHELF.

On the Creation and Physical Structure of the Earth.
By J. T. Harrison, F.G.S., M.Inst.C.E. (London: Longmans, 1889.)

THIS book brings to mind one of the most winning of the vagaries of childhood. A bright child of an inquiring turn will sometimes sit with comical sedateness listening to the talk of its elders. It may afterwards be overheard repeating to one of its playmates, or to some lucky adult who has the knack of winning its confidence, such detached scraps of the conversation as have found a resting-place in its little brain; and, conscious even at its early age of the necessity of some continuity in a narrative, filling up the gaps with inventions or criticisms of its own, charming every way, but mainly on account of their utter want of connection with the subject of the conversation which it is attempting to report. So our author has listened to the teaching of many geologists, and has culled many detached passages from their writings: these he repeats to the world in a book, printing between them comments and lucubrations of his own, about as innocent and as little apposite as the child's prattle—hardly so amusing, however. The following passage is a fair sample of the writer's own share in the book. "The termination of the Secondary Period, which introduced these altered conditions of the surface of the northern hemisphere, was really the commencement of what is called the Glacial epoch in Europe. We have noted signs of glaciation during the deposition of the upper chalk in India and North America, but now the conditions which induced that glaciation are extended in such a manner as to unite these districts, and produce that enormous accumulation of snow and ice at the North Pole, the weight of which in the Miocene epoch depressed the crust in that region and upheaved the mighty mountain ranges to which I have just referred."

The book bristles with cataclysms and catastrophes. The shifting of a thin crust on an internal nucleus which it does not fit, and incessant protrusions of granite, are invoked to account for phenomena which every-day people still persist in thinking are satisfactorily explained by every-day causes. But the author is one born out of due time—two centuries too late. How he and Burnet would have enjoyed a crack together! But there is this to be said, the "Sacred Theory of the Earth" is Burnet's own: the staple of the present work consists of extracts from the works of others. The mottoes are verses from the first chapter of Genesis, but their relevancy to the subject-matter of the chapters which they head is not obvious.

A. H. G.

Through Atolls and Islands in the Great South Sea.
By F. J. Moss. (London: Sampson Low, 1889.)

MR. MOSS—a member of the House of Representatives, New Zealand—started from Auckland, in September 1886, in the schooner *Buster*, for a voyage among the islands and islets of "the outer lagoon world." He was absent seven months, and during that period he crossed the equator six times, and visited more than forty islands among the least frequented groups. In the present

volume he sums up the impressions produced upon him by what he saw and heard in the course of his voyage. Mr. Moss, in dealing with matters which really interest him, shows that he is an accurate observer and a man of sound judgment. His style, although plain and unpretending, is well fitted for the task he has fulfilled. The best parts of the book are those in which he tries to convey some idea of the daily life led by those natives whose customs he had an opportunity of studying. He appreciates warmly some aspects of the various Polynesian types of character, but thinks that the people are likely to degenerate rapidly, unless they can be provided with a better class of native teachers than most of those to whom the duty of guiding them is now intrusted. What is needed, he thinks, is, that the islanders shall have in their work and in their amusements freer scope for the imaginative powers with which they are endowed, and the exercise of which is too often foolishly discouraged. Everything Mr. Moss has to say on this subject deserves the serious consideration of those to whom his warnings and counsels are either directly or indirectly addressed.

LETTERS TO THE EDITOR.

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Who Discovered the Teeth in *Ornithorhynchus*?

IN NATURE of November 14 (p. 31), Profs. Flower and Litter criticise my note which appeared the week previous (November 7, p. 11), concerning the discovery of teeth in the young *Ornithorhynchus*. They promptly dismiss my claim that Sir Everard Home discovered the teeth of the young *Ornithorhynchus*, by stating that the structures described and figured by Sir Everard are the well-known cornules of the adult animal.

If they will take the trouble to turn to the plate cited by me—namely, Plate lix. of the second volume of Home's "Lectures," 1814—and will read the accompanying explanation, they will see that Home was familiar with the teeth of both the young and the old animal.

For the benefit of those who may not have access to Home's "Lectures," I here reproduce outline tracings of two of his figures. Plate lix. Fig. 2, shows the teeth of the young *Ornithorhynchus*—the "first set," as Home says, "to show that there are two grinding teeth on each side." The next figure is a similar tracing from the succeeding plate in Home's "Lectures" (Plate lx.), which represents, to again use Home's words, "the under jaw of the full-grown *Ornithorhynchus paradoxus*, to show that there is only one grinder on each side." Both of these figures are natural size.

In the face of these facts, further comment seems unnecessary.

I admit, of course, that Home did not discover the chemical composition of the teeth of the young animal—this was Poulton's discovery.

C. HART MERRIAM.

Washington, D.C., November 30.

[We do not reproduce the outlines sent, as anyone interested in the subject may see the originals, not only in Home's "Comparative Anatomy," but in the Philosophical Transactions, where they first appeared.—ED. NATURE.]

I SHOULD be very sorry to deny the credit of any discovery to Sir Everard Home, or anyone else, if any evidence could be shown of its having been made. Of the figures cited by Dr. Hart Merriam, that of the younger animal seems (as far as can be judged from the roughly executed engraving, with the assistance of the descriptive text) to represent the horny plates, showing the hollows from which the true teeth have recently fallen; that of the old specimen, the same plates after they are fully grown, and their surfaces worn down by attrition. This difference led Home to conjecture that these plates were changed during the growth of the animal—a view which was corrected by Owen ("Comp. Anat. of Vertebrates," vol. iii. p. 272), by the statement